

CLAIMS

1. A method of analyzing blood, comprising:
delivering a blood sample to a test device;
applying a spatially varying electric field to the blood sample to provide a portion of the blood sample with a depleted cell concentration; and
sensing a property of the portion of the blood sample.
2. The method of claim 1, wherein the property of the portion of the blood sample is at least one of a presence and a concentration of a blood analyte.
3. The method of claim 1, wherein the depleted cell concentration in a portion of the blood sample corresponds to a plasma rich portion of the blood sample having a reduced red blood cell concentration, and wherein sensing the property of the blood sample comprises measuring the property in the plasma rich portion of the blood sample.
4. The method of claim 1, further comprising:
delivering the blood sample to a test chamber; and
performing the sensing of the property of the blood sample in the test chamber.
5. The method of claim 4, wherein applying the spatially varying electric field is performed in the test chamber.
6. The method of claim 4, wherein sensing the property of the blood sample is performed at at least one of during application of the spatially varying electric field and after application of the spatially varying electric field.

7. The method of claim 6, wherein sensing the property of the blood sample is also performed before application of the spatially varying electric field.

8. The method of claim 4, wherein applying the spatially varying electric field is performed on the blood sample within the test device before delivering the blood sample the test chamber.

9. The method of claim 8, wherein applying the spatially varying electric field to the blood sample separates the blood sample into a first portion having a reduced concentration of red blood cells, corresponding to the depleted cell concentration portion of the blood sample, and a second portion having an enriched concentration of red blood cells.

10. The method of claim 9, further comprising:
delivering the first portion of the blood sample into the test chamber prior to sensing the property of the blood sample.

11. The method of claim 9, further comprising:
delivering the second portion of the blood sample into a collecting chamber of the test device separate from the test chamber.

12. A blood analyzer, comprising:
a fluid flow path for receiving a blood sample;
a sensor disposed in the fluid flow path and configured to measure a property of a portion of the blood sample; and
an electrode arrangement configured to generate a spatially varying electric field in the fluid flow path to reduce a cell concentration in the portion of the blood sample.

13. The blood analyzer of claim 12, wherein the property comprises at least one of a concentration and a presence of a blood analyte.

14. The blood analyzer of claim 12, wherein the fluid flow path defines a test chamber including the sensor.

15. The blood analyzer of claim 14, wherein the electrode arrangement is configured to apply the spatially varying electric field in the test chamber to reduce the cell concentration adjacent to the sensor.

16. The blood analyzer of claim 14, wherein the fluid flow path includes a conduit portion for receiving the blood sample before the blood sample reaches the test chamber, and wherein the electrode arrangement is configured to cause the reduced cell concentration in the portion of the blood sample before the blood sample reaches the test chamber.

17. The blood analyzer of claim 16, wherein the conduit portion is configured to conduct the sample in a first direction, and wherein the electrode arrangement is configured to deflect cells in a second direction transverse to the first direction.

18. The blood analyzer of claim 17, wherein the electrode arrangement is configured to generate a traveling wave in the spatially varying electric field in the second direction and configured to generate a high field region for deflecting cells in the second direction away from the test chamber.

19. The blood analyzer of claim 18, wherein the electrode arrangement comprises:

- a linear electrode array disposed within the fluid flow path for generating the traveling wave; and

- a gate electrode array disposed at a junction of the conduit portion and the test chamber and configured to generate the high field region for deflecting cells away from the test chamber.

20. The blood analyzer of claim 12, further comprising:

a meter comprising a waveform generator configured for generating a signal that produces the spatially varying electric field and configured for controlling a measurement at the sensor; and

a test strip comprising the fluid flow path, the sensor, and the electrode arrangement, the test strip being removably insertable into the meter for electrical communication with the meter to receive the signal and to perform the measurement of the property of the blood sample.

21. The blood analyzer of claim 14, wherein the test chamber comprises a plurality of walls including a top wall, a bottom wall, and a pair of side walls, wherein the sensor is disposed on one of the plurality of walls that is at least one of opposite from and perpendicular to one of the plurality of walls on which the electrode arrangement is disposed.

22. The blood analyzer of claim 14, wherein the sensor and the electrode arrangement are disposed on a same wall of a plurality of walls of the test chamber.

23. The blood analyzer of claim 22, wherein the sensor and the electrode arrangement define a single unit on the top wall of the test chamber, and the electrode arrangement is configured to impart a traveling wave in the spatially varying electric field to repel cells away from the sensor prior to or during sensing of the property of the blood sample.

24. The blood analyzer of claim 21, wherein the test chamber defines a plurality of walls and one of the plurality of walls that includes the sensor defines a surface, wherein the sensor is located below the surface of the one of the walls.

25. The blood analyzer of claim 12, wherein the sensor is at least one of an optical sensor mounted external to the fluid flow path and configured to emit light through the fluid flow path to measure the property of the blood sample and

an electrochemical sensor mounted within the fluid flow path to measure the property of the blood sample.

26. The blood analyzer of claim 12, wherein the electrode arrangement is at least one of an electrode pair, a spiral electrode array, a linear electrode array, and a nested square electrode array.

27. The blood analyzer of claim 26, wherein the electrode arrangement comprises a plurality of electrode elements in which at least one of the electrode elements includes a hybrid element which defines both the sensor and a field electrode configured to apply the spatially varying electric field in cooperation with the other electrode elements.

28. The blood analyzer of claim 27, further comprising system electronics configured for first applying the spatially varying electric field as a traveling wave in the relative absence of the cells from the sensor and for later operating the sensor of the electrode arrangement to measure the property of the blood sample to repel cells from the electrode arrangement.

29. A handheld glucose meter, comprising:
means for holding a blood sample;
means for identifying a quantity of glucose within the blood sample; and
means for electrically redistributing red blood cells of the blood sample away from the means for identifying the quantity of glucose to enhance the identification of the quantity of glucose within the blood sample.

30. The meter of claim 29, wherein the means for holding the blood sample comprises a test strip that is removably insertable into the meter, wherein the test strip includes a test chamber for holding the blood sample and for catalyzing a reaction between test enzymes and the blood sample for electrochemical reaction with the means for identifying a quantity the glucose.

31. The meter of claim 30 wherein the means for identifying the quantity of glucose comprises a sensor electrode disposed within the test strip and configured to electrochemically detect the quantity of glucose within the blood sample; and

wherein the means for electrically redistributing red blood cells is disposed within the test strip and comprises an electrode arrangement configured to apply a dielectrophoretic field to the blood sample to alter the concentration of red blood cells adjacent to the sensor electrode.

32. A method of testing a property of blood, comprising:

obtaining a blood sample within a test strip of a self-monitoring glucose meter;

applying a first spatially varying electric field to the blood sample within the test strip to separate and exclude a first plurality of red blood cells from the blood sample to produce a modified blood sample;

delivering the modified blood sample into a test chamber; and

applying a second spatially varying electric field to the modified blood sample within the test chamber to produce a relatively lower concentration of red blood cells adjacent a sensor within the test chamber to enhance measurement of glucose within the modified blood sample at the sensor.